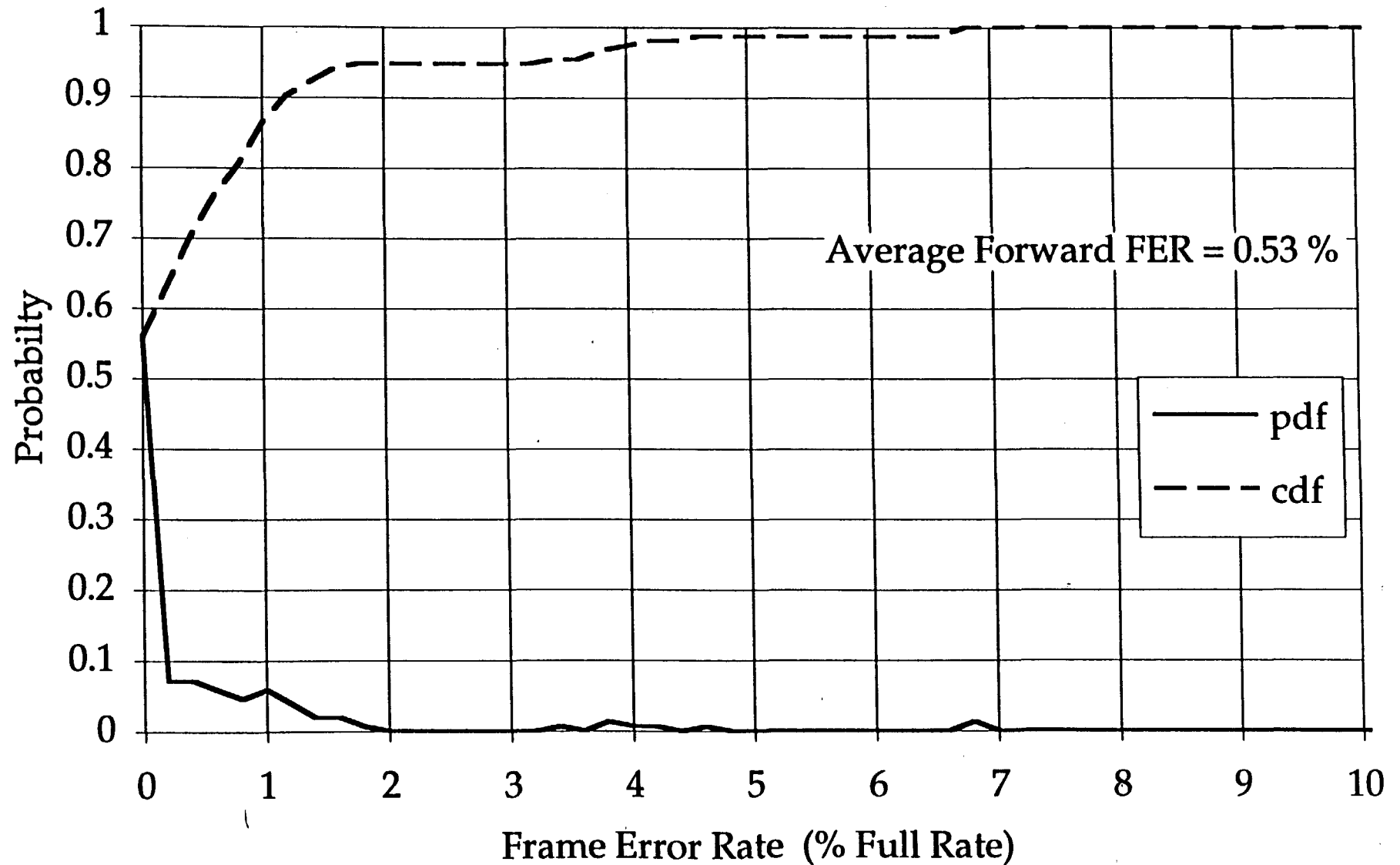
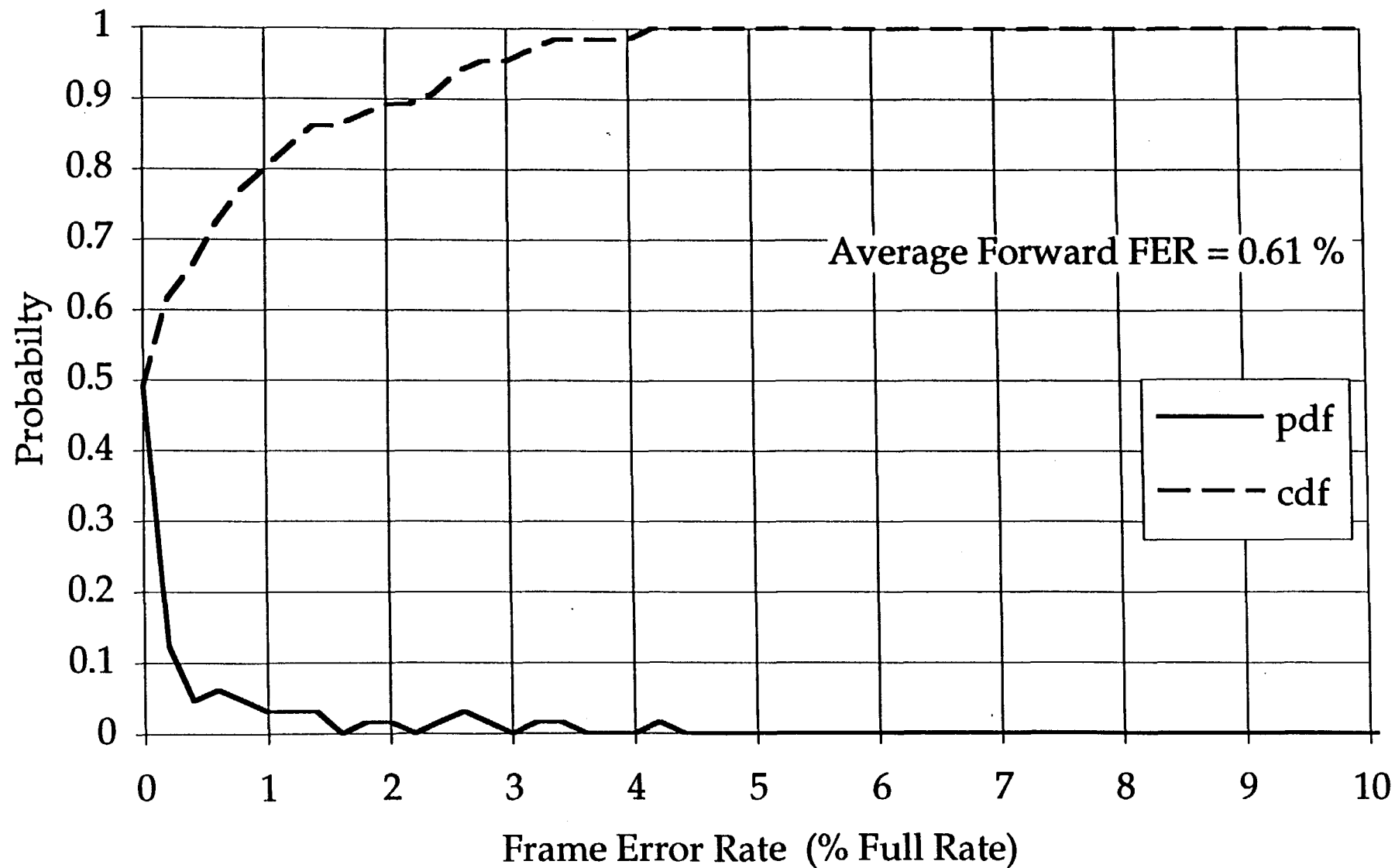


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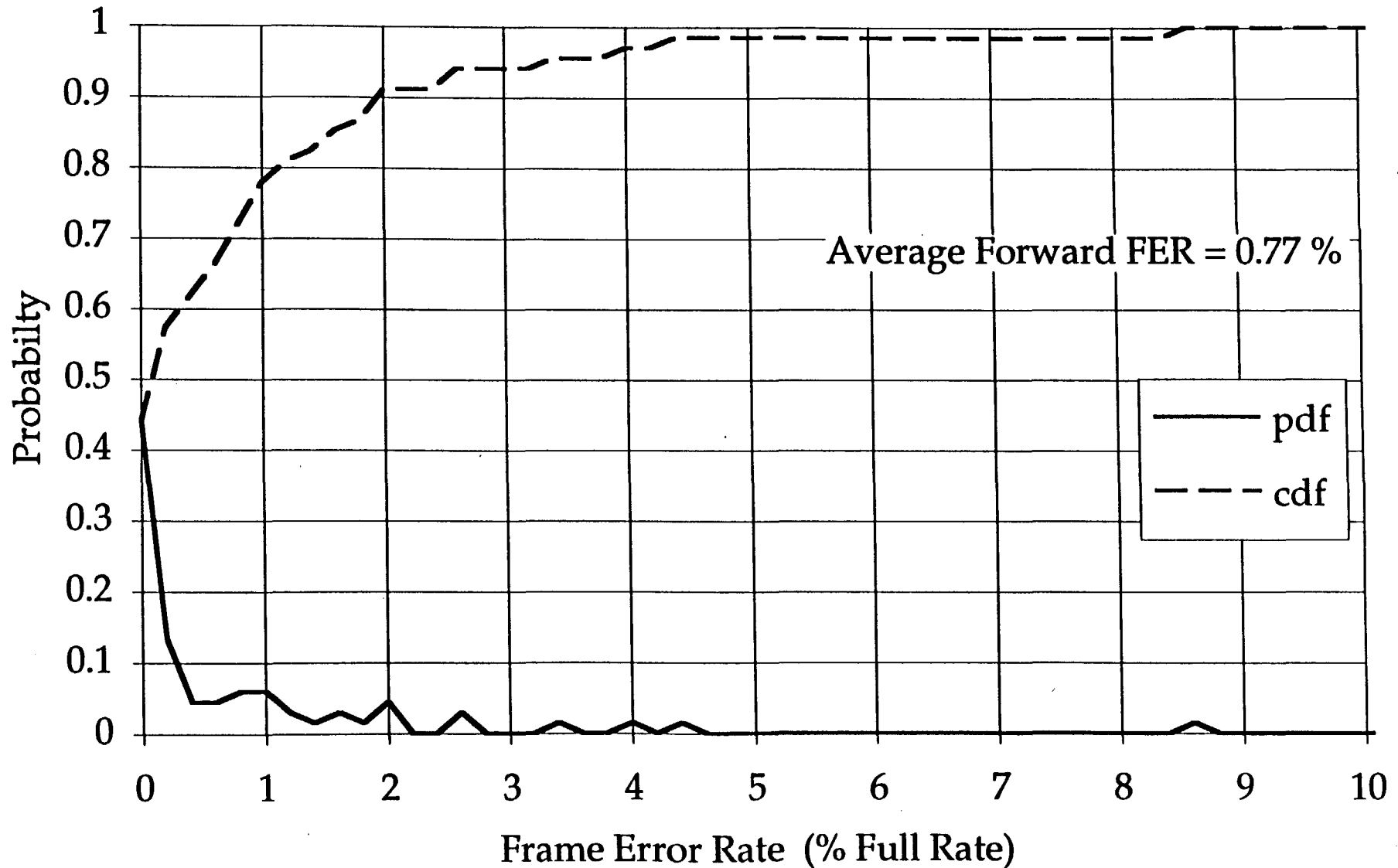
Forward Frame Error Rate Statistics for Capacity Tests  
11/22/1991, Runs 2 - 5, 60 Mobiles, No OUNS



Forward Frame Error Rate Statistics for Capacity Tests  
11/22/1991, Runs 6 - 7, 62 Mobiles, OUNS Config 3B

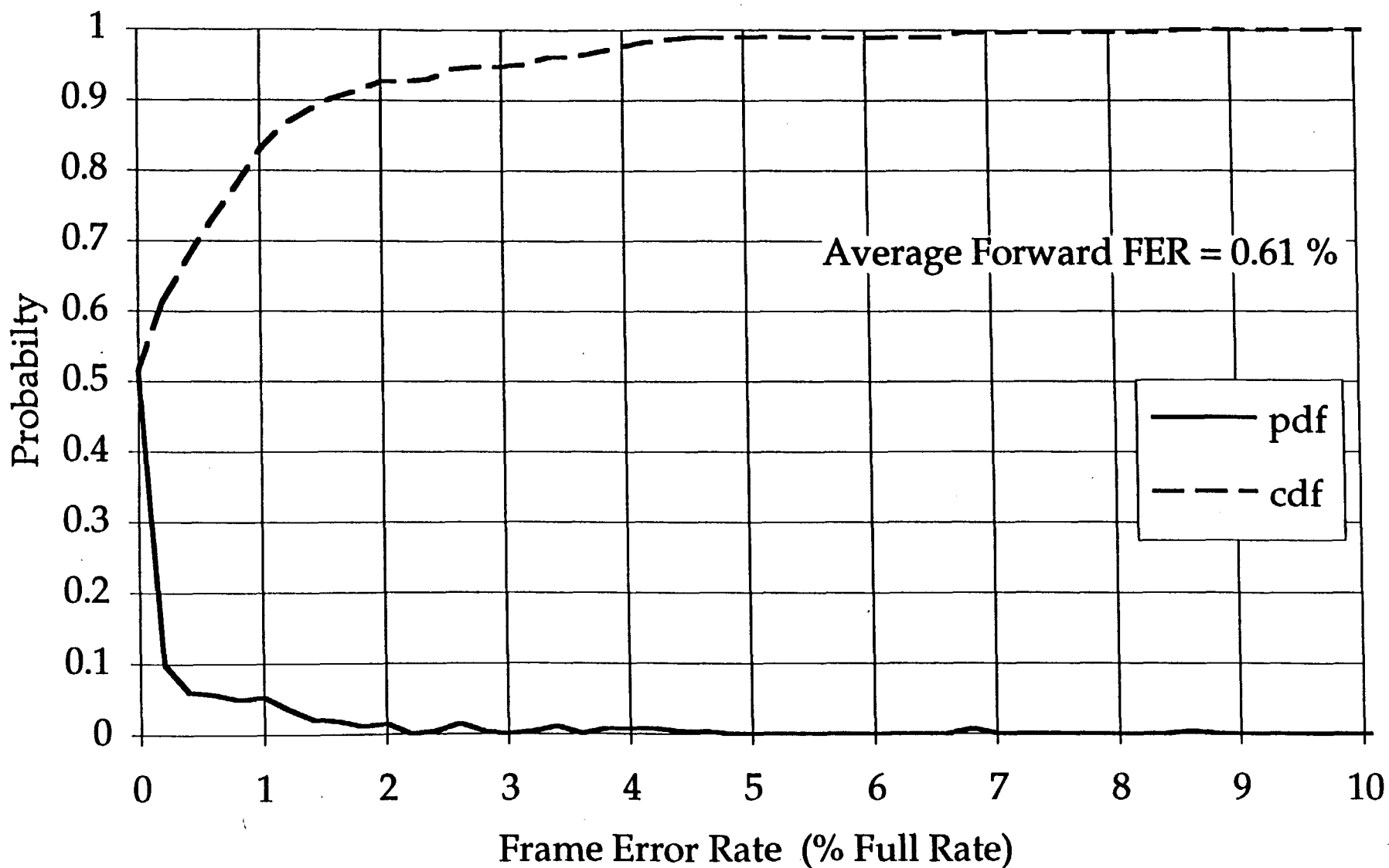


Forward Frame Error Rate Statistics for Capacity Tests  
11/22/1991, Runs 8 - 9, 65 Mobiles, No OUNS, New Outer Loop



# Forward Frame Error Rate Statistics for Capacity Tests

11/22/1991 All Runs



## 7.2 FER Versus Speed Results

The Frame Error Rate (FER) versus the mobile's speed (vehicle's speed) measures the quality of the link (either forward or reverse) over the range of mobile speeds. These FER values are a measure of the quality that the user would recognize in the system in typical ranges of vehicular speeds. In the FER results, the FER versus speed results are expressed as a percentage of the number of frames in error over the total number of transmitted frames.

During the capacity tests, testing vans were driven at speeds ranging from 0 mph (parked or stopped vehicle) over 55 mph. The vehicle speed was measured by the ETAK system installed in each testing van and was logged by the mobile's diagnostic monitor in each van.

The calculation of the FER statistics is based on the Markov process. Frames in error are defined as frames that either receive incorrect rates during the Markov process checking or frames that contains bits in error.

The FER versus speed calculations are performed by dividing the total range of vehicle speeds into speed bins of 5 mph. The total number of frames transmitted is counted for each speed bin. The accumulated number of frames in error were then calculated for each of these speed bins. The FER versus speed is the ratio (expressed as a percentage) between these two numbers and is calculated for each speed bin.

### 7.2.1 FER Versus Speed - Reverse Link

Testing vans had up to four mobiles installed in them throughout testing. In each van, a single mobile had the diagnostic monitor hooked up and this specific mobile logged the ETAK data. The speed data that was logged by this specific mobile is used for calculation of the FER versus speed in the reverse link for all the mobiles that were installed in the same van. By using this procedure, additional FER versus speed data was gathered and resulted in improved statistical calculations.

### 7.2.2 FER Versus Speed - Forward Link

Markov statistics as received by a mobile were used for calculating the FER versus speed for the forward link.

In the following sections, the results for the FER versus speed for each day of the capacity testing is given in the form of bar graphs of the FER versus speed in 10 mph speed bins, (for both the forward and the reverse links).

### **7.2.3 Daily Results of FER Versus Speed**

The following sections describe the results of the FER versus speed for the forward and reverse links for each of the testing days.

#### **7.2.3.1 FER Versus Speed for November 18, 1991**

During the first day of isolated sector tests on Fiesta Island, the long-term FER versus speed over full rate for 30-60 mobiles without OUNS/OCNS was:

Forward FER versus speed: 0.00%

Reverse FER versus speed: 0.55%

The resulting graph of the FER versus speed which summarizes the results for November 18, 1991, is depicted in the enclosed section. Note that the results of the forward FER versus speed for Monday November 18, 1991 are 0.00% and therefore, is depicted on the graph.

#### **7.2.3.2 FER Versus Speed for November 20, 1991**

For the isolated sector tests that were conducted without OUNS/OCNS, the long-term FER versus speed over full rate with 25 to 33 mobiles was:

Forward FER versus speed: 0.28%

Reverse FER versus speed: 1.07%

The resulting graph of the FER versus speed which summarizes the results for November 20, 1991, is depicted in the enclosed section.

#### **7.2.3.3 FER Versus Speed for November 21, 1991**

The long-term FER versus speed over full rate for the all sector test in Old Town were:

Forward FER versus speed: 1.50%

Reverse FER versus speed: 0.92%

The resulting graph of the FER versus speed which summarizes the results for November 21, 1991, is depicted in the enclosed section.

#### **7.2.3.4 FER Versus Speed for November 22, 1991**

On November 22, the test included approximately 60 mobiles that were evenly distributed between the three sectors of the Mission Bay cell. No other cells were active. Of the nine logging runs conducted, only runs 6 and 7 had OUNS/OCNS active. The OCNS was off for those runs. The OUNS simulated 20 users per sector.

Forward FER versus speed: 0.63%

Reverse FER versus speed: 0.89%

The resulting graph of the FER versus speed which summarizes the results for November 22, 1991, is depicted in the enclosed section.

#### 7.2.3.5 FER Versus Speed for November 23, 1991

These tests included more than 60 mobiles, placed in the Mission Bay Alpha sector and in its adjacent soft and softer handoff regions. All sectors of Mission Bay, plus the Mt. Ada, Mission Valley, and Downtown cells were active.

Two configurations of the OUNS were used on November 23, 1991. The first configuration included OCNS/OUNS to simulate even loading of 20 users per sector in all sectors of all cells. The number of actual mobiles in the test was 40. The second configuration included OCNS/OUNS to simulate even loading of 30 users per sector in all sectors of all cells. The number of actual mobiles in the test was 60. For all runs on the reverse link, the long-term FER versus speed over full rate was 1.34%.

The resulting graph of the FER versus speed which summarizes the results for November 23, 1991, is depicted in the enclosed section. Since forward FER data was not available for November 23, the results of the forward FER versus speed for November 23, 1991 are not depicted on the graph.

Table 7.2.3-6 summarizes the long-term FER versus speed over full rate for all the testing days.

**Table 7.2.3.6. Long-term FER Versus Speed Over Full Rate**

Date	Forward FER Versus Speed (percent)	Reverse FER Versus Speed (percent)
11/18/1991	0.00%	0.55%
11/20/1991	0.35%	1.76%
11/21/1991	1.50%	0.92%
11/22/1991	0.63%	0.89%
11/23/1991	N/A	1.34%



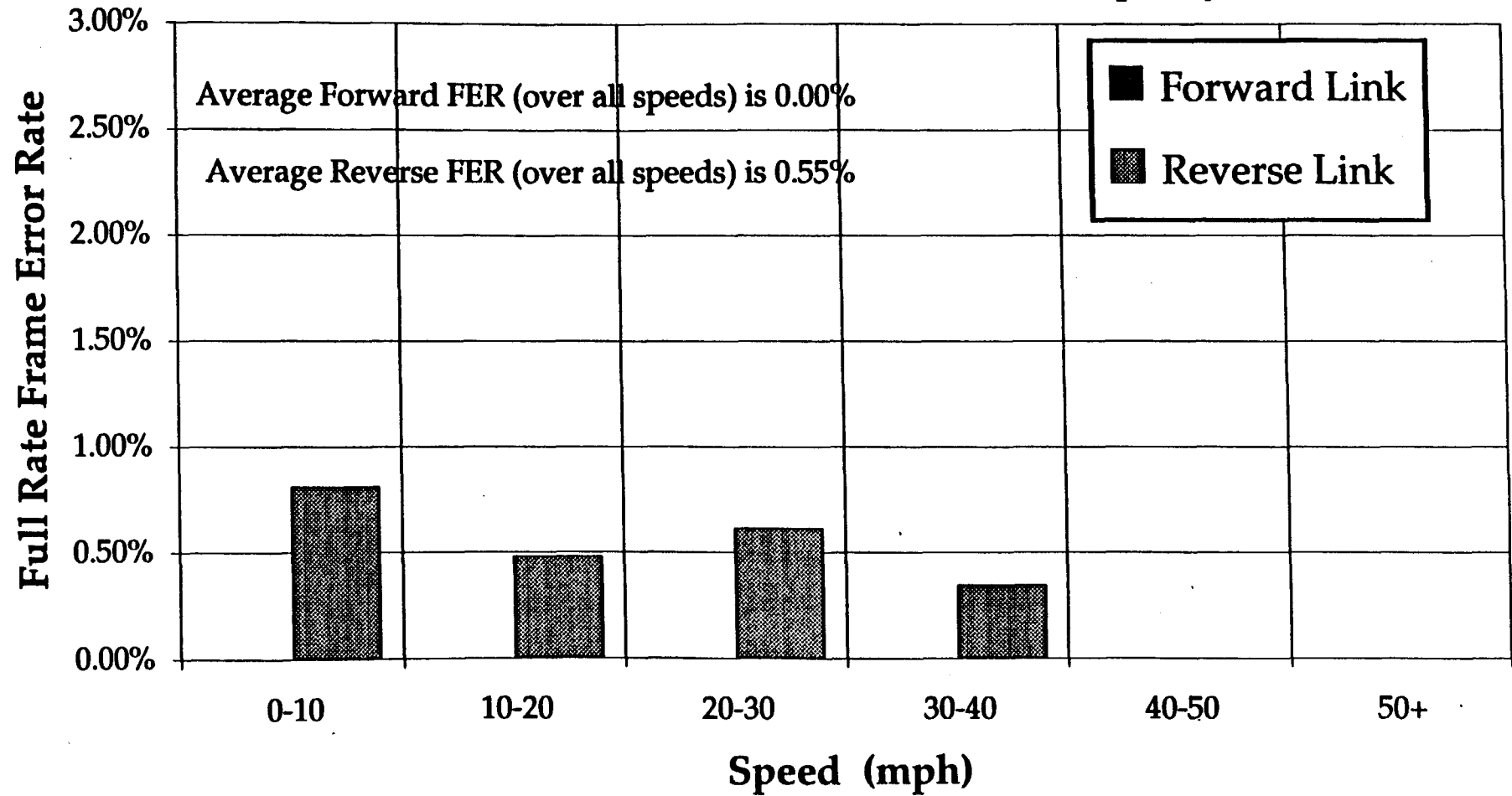
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## **Results of Frame Error Rate Versus Speed for 11/18/1991**

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## Frame Performance vs. Speed

Capacity Tests 11/18/1991



**Table 7.2.3.1: Summary of FER versus Speed for November 18, 1991**

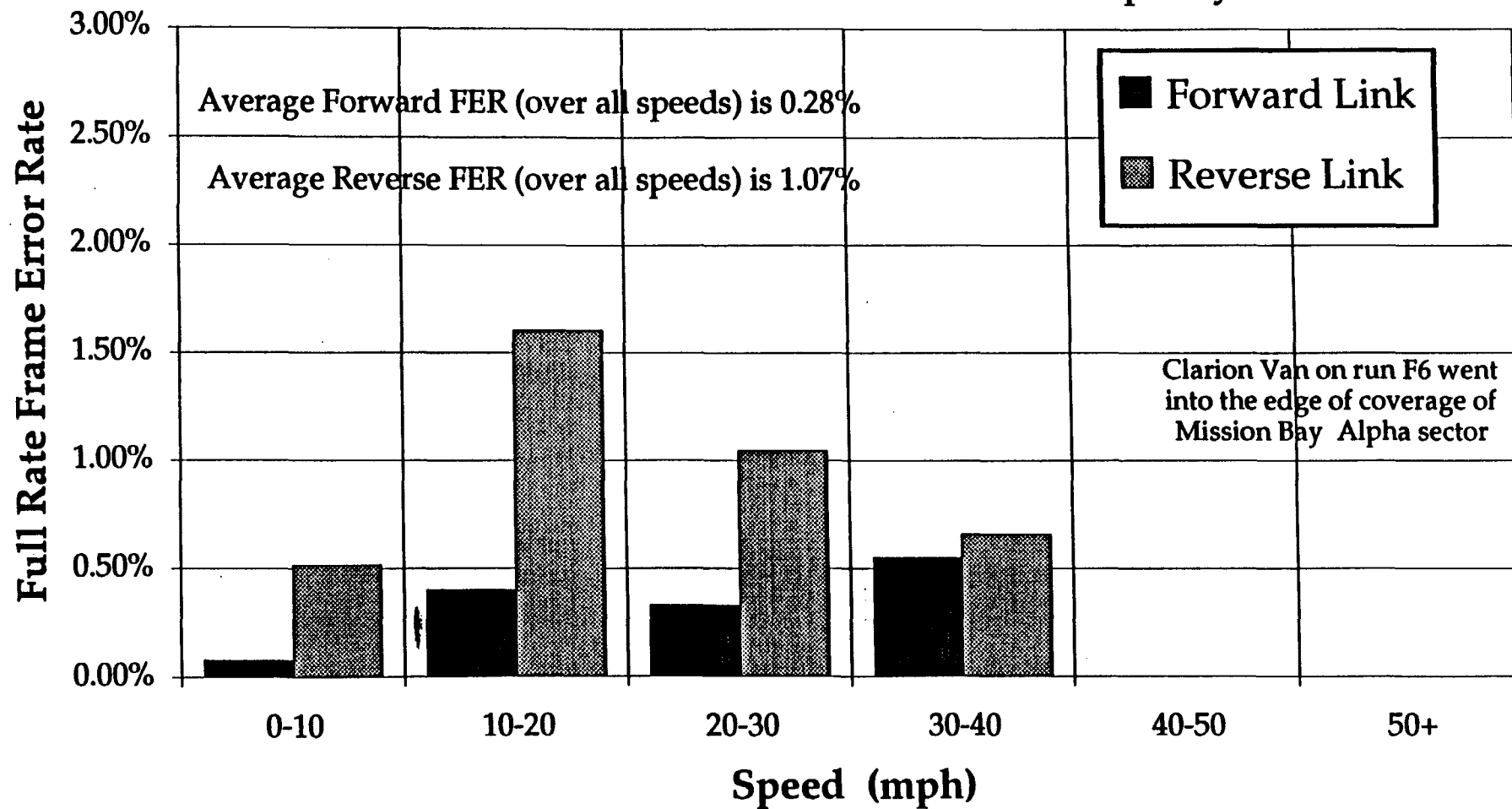
Forward Link FER vs Speed				Reverse Link FER vs Speed		
5mph	Count of	Count of	Forward	Count of	Count of	Reverse
Speed Bin	Frame Errors	Total Frames	FER/Speed	Frame Errors	Total Frames	FER/Speed
0-5	0	120	0.00%	5	531	0.94%
5-10	0	302	0.00%	4	578	0.69%
10-15	0	1260	0.00%	22	4878	0.45%
15-20	0	8664	0.00%	121	24930	0.49%
20-25	0	8094	0.00%	128	18810	0.68%
25-30	0	2472	0.00%	35	7720	0.45%
30-35	0	7	0.00%	3	652	0.46%
35-40	0	0	0.00%	0	214	0.00%
40-45	0	0	0.00%	0	0	0.00%
45-50	0	0	0.00%	0	0	0.00%
50-55	0	0	0.00%	0	0	0.00%
55+	0	0	0.00%	0	0	0.00%
10mph			Forward			Reverse
Speed Bin			FER/Speed			FER/Speed
0-10			0.00%			0.81%
10-20			0.00%			0.48%
20-30			0.00%			0.61%
30-40			0.00%			0.35%
40-50			0.00%			0.00%
50+			0.00%			0.00%
Longterm FER/Speed			0.00%			0.55%

# **Results of Frame Error Rate Versus Speed for 11/20/1991**

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## Frame Performance vs. Speed

Capacity Tests 11/20/1991





**Table 7.2.3.2: Summary of FER versus Speed for November 20, 1991**

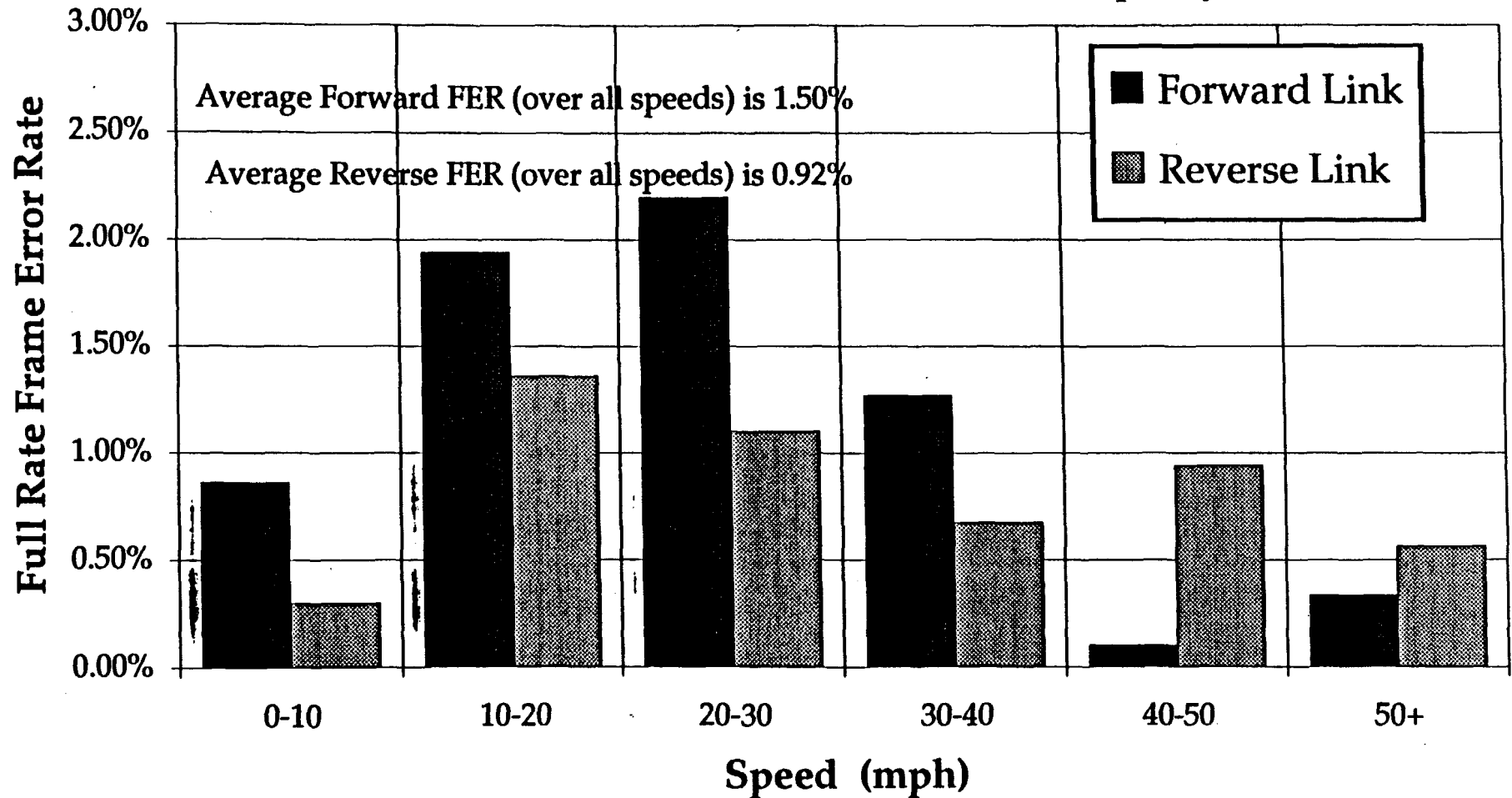
	<b>Forward Link FER vs Speed</b>			<b>Reverse Link FER vs Speed</b>		
<b>5mph</b>	<b>Count of</b>	<b>Count of</b>	<b>Forward</b>	<b>Count of</b>	<b>Count of</b>	<b>Reverse</b>
<b>Speed Bin</b>	<b>Frame Errors</b>	<b>Total Frames</b>	<b>FER/Speed</b>	<b>Frame Errors</b>	<b>Total Frames</b>	<b>FER/Speed</b>
0-5	0	7335	0.00%	43	12533	0.34%
5-10	8	2523	0.32%	43	4105	1.05%
10-15	12	3243	0.37%	135	7893	1.71%
15-20	23	5455	0.42%	167	10922	1.53%
20-25	16	6079	0.26%	122	12426	0.98%
25-30	17	3904	0.44%	58	4766	1.22%
30-35	6	1086	0.55%	8	1182	0.68%
35-40	0	3	0.00%	0	31	0.00%
40-45	0	0	0.00%	0	0	0.00%
45-50	0	0	0.00%	0	0	0.00%
50-55	0	0	0.00%	0	0	0.00%
55+	0	0	0.00%	0	0	0.00%
<b>10mph</b>			<b>Forward</b>			<b>Reverse</b>
<b>Speed Bin</b>			<b>FER/Speed</b>			<b>FER/Speed</b>
0-10			0.08%			0.52%
10-20			0.40%			1.61%
20-30			0.33%			1.05%
30-40			0.55%			0.66%
40-50			0.00%			0.00%
50+			0.00%			0.00%
<b>Longterm FER/Speed</b>			<b>0.28%</b>			<b>1.07%</b>

# **Results of Frame Error Rate Versus Speed for 11/21/1991**

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## Frame Performance vs. Speed

Capacity Tests 11/21/1991



**Table 7.2.3.3: Summary of FER versus Speed for November 21, 1991**

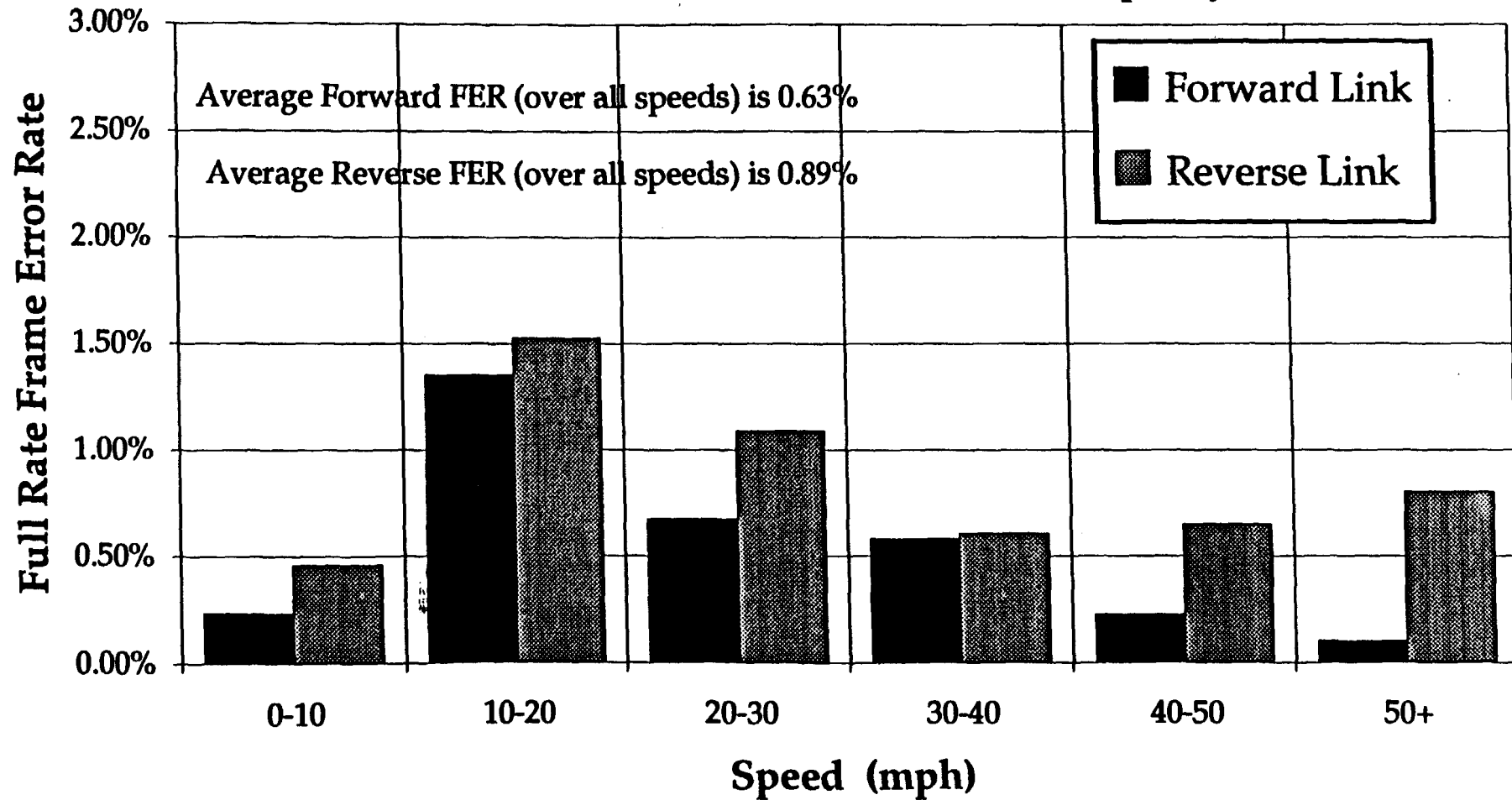
	<b>Forward Link FER vs Speed</b>			<b>Reverse Link FER vs Speed</b>		
<b>5mph</b>	<b>Count of</b>	<b>Count of</b>	<b>Forward</b>	<b>Count of</b>	<b>Count of</b>	<b>Reverse</b>
<b>Speed Bin</b>	<b>Frame Errors</b>	<b>Total Frames</b>	<b>FER/Speed</b>	<b>Frame Errors</b>	<b>Total Frames</b>	<b>FER/Speed</b>
0-5	17	4142	0.41%	12	8960	0.13%
5-10	43	2817	1.53%	29	4726	0.61%
10-15	116	5023	2.31%	114	8858	1.29%
15-20	112	6716	1.67%	178	12624	1.41%
20-25	97	5127	1.89%	128	10643	1.20%
25-30	75	2700	2.78%	75	7779	0.96%
30-35	12	786	1.53%	28	3565	0.79%
35-40	2	317	0.63%	29	4896	0.59%
40-45	0	499	0.00%	15	2129	0.70%
45-50	1	476	0.21%	14	949	1.48%
50-55	6	732	0.82%	5	1780	0.28%
55+	7	3145	0.22%	37	5651	0.65%
<b>10mph</b>			<b>Forward</b>			<b>Reverse</b>
<b>Speed Bin</b>			<b>FER/Speed</b>			<b>FER/Speed</b>
0-10			0.86%			0.30%
10-20			1.94%			1.36%
20-30			2.20%			1.10%
30-40			1.27%			0.67%
40-50			0.10%			0.94%
50+			0.34%			0.57%
<b>Longterm FER/Speed</b>			1.50%			0.92%

## **Results of Frame Error Rate Versus Speed for 11/22/1991**

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## Frame Performance vs. Speed

Capacity Tests 11/22/1991





**Table 7.2.3.4: Summary of FER versus Speed for November 22, 1991**

	<b>Forward Link FER vs Speed</b>			<b>Reverse Link FER vs Speed</b>		
<b>5mph</b>	<b>Count of</b>	<b>Count of</b>	<b>Forward</b>	<b>Count of</b>	<b>Count of</b>	<b>Reverse</b>
<b>Speed Bin</b>	<b>Frame Errors</b>	<b>Total Frames</b>	<b>FER/Speed</b>	<b>Frame Errors</b>	<b>Total Frames</b>	<b>FER/Speed</b>
0-5	22	28128	0.08%	394	108928	0.36%
5-10	62	7670	0.81%	245	29823	0.82%
10-15	192	12379	1.55%	692	44372	1.56%
15-20	235	19203	1.22%	1085	72073	1.51%
20-25	97	12675	0.77%	614	50637	1.21%
25-30	31	6256	0.50%	225	26346	0.85%
30-35	45	6189	0.73%	162	22805	0.71%
35-40	44	9047	0.49%	181	33842	0.53%
40-45	22	5320	0.41%	149	21283	0.70%
45-50	4	6085	0.07%	125	20778	0.60%
50-55	3	5233	0.06%	123	16826	0.73%
55+	5	2526	0.20%	92	9963	0.92%
<b>10mph</b>			<b>Forward</b>			<b>Reverse</b>
<b>Speed Bin</b>			<b>FER/Speed</b>			<b>FER/Speed</b>
0-10			0.23%			0.46%
10-20			1.35%			1.53%
20-30			0.68%			1.09%
30-40			0.58%			0.61%
40-50			0.23%			0.65%
50+			0.10%			0.80%
<b>Longterm FER/Speed</b>			0.63%			0.89%